DOCUMENT RESUME

ED 267 999 SE 046 523

AUTHOR Jones, Gordon E.
TITLE A Demonstration Manual for Inexperienced High School Physics Teachers.
PUB DATE 27 Jan 86
NOTE 6p.; Paper presented at the Annual Meeting of the American Association of Physics Teachers (Atlanta, GA, January 27, 1986).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Course Descriptions; *Demonstrations (Educational); High Schools; *Material Development; *Physics; Science Education; Science Experiments; *Secondary School Science; Teacher Improvement; *Teaching Guides
IDENTIFIERS *Mississippi

ABSTRACT

A course was developed to help science teachers in Mississippi teach physics. Most of those teaching the subject were inexperienced in physics, had limited background in the subject, and were in need of help. The course provided these teachers with a deeper understanding of physics principles, emphasized problem-solving strategies, and included many simple demonstrations and experiments. As a result of the course, a manual containing about 125 demonstrations and 25 experiments was developed. Criteria for selection of demonstrations and experiments included the following: (1) they should illustrate clearly and directly the concepts that teachers would normally include in their courses; (2) they should be simple to perform; and (3) they should require a minimum of expensive or specialized equipment. The manual has been enthusiastically received by Mississippi high school physics teachers and illustrates how an institution of higher education can be of significant service to high school teachers. (JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

A DEMONSTRATION MANUAL FOR INEXPERIENCED HIGH SCHOOL PHYSICS TEACHERS

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
✓ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Gordon E. Jones
Department of Physics
Mississippi State University

Atlanta Meeting of AAPT
January 27, 1986

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Gordon E. Jones
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ED267999

Nineteen eighty-two was a typical year in Mississippi--typical in that our 300 public high schools employed 110 teachers of physics. And, of these 110 physics teachers, 95 were not certified to teach physics, but were certified in other subjects, usually chemistry and/or biology. These teachers were forced into the physics classroom by their principals--not their ethical principles or the principles of physics, but by their high school principals.

This happens because the State permits the teaching of one or two sections provided the teacher has had twelve hours of college physics. Usually this means a general physics sequence, and an astronomy course or a 3-hr workshop that was picked up one summer. Although some of these teachers turn out to be very effective as physics teachers, our situation is that, at any one time, the majority are inexperienced in physics, have limited background in physics, and need help.

When we began our program of cooperation with high school teachers five years ago, their first-priority request was that the Physics Department at Mississippi State teach them the course that they had to teach. We did, and that has been reported in The Physics Teacher.

Our first job, we felt, was to make teachers comfortable with the material, so we designed the course to provide them with a deeper understanding of the principles. Then we included an emphasis in problem solving, to increase their ability and confidence in that area. Secondarily, we added as many simple demonstrations as we could think of. A portion of

SE046 523

each class period was devoted to the presentation of demonstrations by the participants to the rest of the class. As part of the grade, each student had to submit a write-up of each demonstration performed. The idea was that, in addition to learning the subject matter, as a bonus, each participant would go home with a collection of descriptions of demonstrations that were appropriate for high school students and that could be performed with the equipment that almost any high school would have available.

The course went well and was received enthusiastically by the teachers, that is, by the relatively few that could justify the expense and inconvenience of giving up a portion of the summer to leave their families and take the course. All things considered, we regarded 15 participants as a good turnout, but what about the other 200 teachers in private and public schools in the State that we weren't reaching? It wasn't feasible to take the course to them, but one thing that did occur to us, as an afterthought, was that we could at least mail copies of the demonstration write-ups to other teachers.

This turned out to be not so simple as it sounded. Fundamentally, it seemed that we could merely select at the end of the course one of the collections compiled by the participants, copy it, and send it out. And fundamentally, that's what we did, but there were a couple of significant problems. With over 200 physics teachers in Mississippi there was a lot of copying and a lot of postage required. The second problem was a real headache. None of the collections of demonstration write-ups was so well written and well illustrated that we could merely copy it. A lot of editing had to be done.

But we did it, and we mailed, free of charge, to every physics teacher in the State, a stapled collection of pages that described 60 or 70 simple

demonstrations that any physics teacher could perform--no matter how inexperienced--no matter how scarce the resources.

(Hold up a copy of the mailout.)

This was done at the end of the summer after the course was over. We received many letters of gratitude from all over. Numerous physics teachers whose addresses we didn't have heard about the mailouts and wrote for copies. Many physical science teachers asked for them. We weren't prepared for all the approbation and even felt a little guilty about it. The demonstrations were not new; we originated very few of them. Most would be pretty ho-hum to this audience. But they were exciting to these teachers. Most of them had never seen the AAPT demonstration manual, or any other manual, we came to realize. Most of them don't read The Physics Teacher, very few attend meetings of the Mississippi Association of the AAPT, and virtually none has been to a national AAPT meeting. So, as an afterthought, we had stumbled onto a way to have an impact all over the State.

The next summer, we taught the class again. We decided to add more demonstrations and planned indirectly to send them out as supplements to the original mailout. Then came a series of fortuitous circumstances. One of our department members had taken an administrative position in the Dean's Office. At the end of the fiscal year, $500 was left unspent in one of the budget categories, and he was able to get that money to support the mailouts. Then, one of our other projects that had been funded by a small grant had not worked out, so we were able to re-direct some of that money. And, finally, we discovered that the husband of our secretary was an amature artist.

All this led us to decide to make the stapled collection of demonstrations a little nicer and a little more readable. We went back and sharpened the syntax a little, proof-read more carefully, added more

demonstrations, added illustrations, and put a cover on it. Then, again, we sent one free of charge to every high school physics teacher in Mississippi.

The manual contains about 125 demonstrations and 25 to 30 experiments. Although some of these demonstrations and experiments were designed by members of the Physics Department at Mississippi State University and a few others were contributed by high school teachers in the course, most are not original. Many are well known and appear in some form in other manuals. Utility rather than originality was the main criterion. Specifically, the following considerations were made: (1) they should illustrate the same physical concepts that teachers would normally include in their courses, and they should illustrate these clearly and directly; (2) they should be simple to perform; and (3) they should require a minimum of expensive or specialized equipment.

Each demonstration and experiment was labeled by a (I) or a (II), which appears in the text after the title. A (I) designation indicates that the equipment or material required is particularly simple. It is not expensive nor does it require shop skills to build. Some of the demonstrations designated (II) require equipment that not every high school science class will have available. In many cases, however, the equipment can be constructed readily and inexpensively in the school shop. Some of the demonstrations can be modified to avoid the need for equipment that is not on hand.

(Hold up a copy of the manual.)

We continued to receive requests for these, so we used the final few dollars of our grant money to print a few more for distribution to the teachers in Mississippi. We have also received external requests, and we have sent copies to teachers outside Mississippi, but we have had to charge enough to cover our costs on these external requests.

In retrospect, I sometimes wonder: why did we go to the trouble to produce another manual of physics demonstrations? There are already good ones available--probably better than ours--certainly more complete and more original. And I'm sure if our high school teachers had asked us at the outset of the project to produce a demonstration manual, we would have declined.

It wasn't our intention to produce a manual; we had almost done that before we realized it. We were merely trying to increase the effectiveness of our summer school course; at the time, it made eminently good sense to acquaint all of our inexperienced teachers with the information that some of them had obtained with us.

Even after our success with it, I would be very reluctant to recommend our manual to this audience or even to high school teachers outside our own state. After all, you and they have access to very good manuals already.

But I think that the manual is significant enough to report, because, of our numerous projects and activities with high school teachers, this is probably the one that has been the most enthusiastically received. And, further, I think that the manual illustrates that a modest effort by a college or university, an effort that is unremarkable for its originality, can be a significant service to high school physics. It just has to be the right effort at the right place and at the right time.